Monitoring change in diabetes care using diabetes registers

Experience from divisions of general practice

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BACKGROUND
The quality of care for patients with type 2 diabetes has been the subject of a number of government initiatives over the past decade. General practice has an especially important role in diabetes care.

METHODS
The National Integrated Diabetes Program was introduced in 2001. Changes in the frequency of assessment and the physiological markers of diabetic control were assessed in a cohort of 2731 patients with type 2 diabetes from 16 general practice diabetes registers during 2000–2002.

RESULTS
Frequency of assessment was better in patients living in low socioeconomic postcodes but did not change significantly over the 3 years. There were improvements in intermediate outcomes (HbA1c, systolic and diastolic blood pressure, lipid levels) over the period.

DISCUSSION
These data provide a benchmark for improvement in the quality of diabetes care in general practice.

Tight blood sugar and blood pressure (BP) control is possible in type 2 diabetes and reduces both macrovascular and microvascular complications.[1,2] It can be achieved by structured systematic care of patients in general practice.[3] This needs to be underpinned by information systems that assist with recall and audit, along with provider education, multidisciplinary team work, and shared care with specialist services.[4]

Since their inception in 1992, many divisions of general practice[5] have set out to support systematic care for people with diabetes by disseminating evidence based guidelines, educating general practitioners and consumers, providing allied health and shared care with secondary services, as well as establishing local registers for recall and audit.[6] Yet many patients with diabetes do not receive optimal care. Measures of optimal care have been outlined by The Royal Australian College of General Practitioners and Diabetes Australia in the *Diabetes management in general practice guidelines* for 2000,[7] and intermediate health outcome indicators identified in the diabetes metadata set.[8]

We aimed to look for evidence that divisionally orchestrated registers were associated with improvements in quality.

Methods

This study was part of the National Divisions Diabetes Program (NDDP) Divisions Diabetes and Cardiovascular Quality Improvement Project (DDCQIP).[9] We examined a cohort of general practice patients over 3 years.

Division participation

Between July to October 2002, 38 divisions of general practice were identified that used the electronic diabetes patient register CARDIAB, of which 23 had continuous data for at least 3 years. Of these, 19 agreed to participate. Data were excluded from three because the registers were not adequate (eg. included many nonactive patients), leaving 16 divisions in the final data analysis. Data were extracted for 3 years: 2000, 2001, and 2002.

Patient population

Using the age adjusted prevalence estimates from the

Australian Diabetes, Obesity and Lifestyle Study (AusDiab), which is the best available data on prevalence in Australia,[10] and applying these to raw 1996 Australian Bureau of Statistics Census data, we estimated the number of people aged over 25 years in these divisions who had diabetes. We compared this with the total on the registers.

Data management

General practitioners provided patient data for entry into divisional registers. De-identified data were electronically extracted from the registers in each participating division, then compiled and cleaned (checking with the divisions about missing items or obvious errors) as previously described.[6] They included age, gender, postcode, the type of diabetes and its duration and treatment, date of most recent visit, the frequency of assessments of the behavioural risk factors, HbA1c, BP, weight, lipids, urinary microalbumin, foot checks, eye checks, and any referrals to allied health or specialist services.[8]

Patients participating in the registers individually gave consent to their data being provided to the division registers. Ethics approval was granted by the University of New South Wales Human Research Ethics Committee.

Analysis

After descriptive analysis, hierarchical 2 level modelling was used to detect factors associated with process and immediate outcomes adjusted for the effect of clustering of patients within practices,[11] but not with individual doctors because patients attended more than one in any practice.

Results

A median of 41 GPs in each division registered patients, compared with a median of 94 who did not, their demographic details being broadly similar (*Table 1*). The population estimate of diabetes prevalence (of people over 25 years of age) in all divisions was 126 386. Comparing this to the actual numbers on the registers (9268 in 2000, 11 454 in 2001, 15 294 in 2002) showed that the registers represented 8.2%, 11.2% and 20.2% of those estimated to have diabetes in each respective year.

The cohort of 2731 patients registered for all 3 years represented 6.4% of the estimated prevalence of diagnosed type 2 diabetes in these 16 divisions. They were registered by 355 GPs (7.7 per GP).

Table 1. Comparison of GPs who registered patients for divisional diabetes register and those who did not

GPs	GPs registering	GPs not registering	*p*
Female	29.3	31.1	>0.05
>55 years age	17.2	14.1	>0.05
Solo practice	18.0	19.8	>0.05
>4 GPs in practice	32.6	38.6	>0.05
Accredited practice	76.4	61.7	>0.05
Overseas graduated	18.2	17.2	>0.05
Full time	86.0	74.3	<0.01

Patients in the cohort were older (mean age 65.6 vs. 61.6, $p<0.001$), had diabetes for longer (6.7 vs. 6.1 years, $p<0.001$), and had a lower total cholesterol (4.8 vs. 5.1, $p<0.01$) than those on the registers but not in the cohort. There were no significant differences in gender, HbA1c, systolic and diastolic BP, or body mass index.

The frequency of assessments of patients did not change over the period (mean 4.6 assessments in both 2000 and 2002). Among the factors associated with an increased likelihood of having received six or more of the process of care assessments in 2002, was low patient socioeconomic status (SEIFA index of the patient's postcode) and division community outreach programs for diabetes.

There were significant reductions in HbA1c, systolic and diastolic BP, total cholesterol, LDL and triglycerides over the 3 years, but not HDL levels or BMI (*Table 2*). There was significant clustering effects at the practice but not division levels, thus two-level hierarchical analysis was used to adjust for clustering of patients at the practice level to test the association between patient factors (age, sex and duration) and quality of care (six or more assessments in 2002) with values of HbA1c, BP and lipids in 2002. This analysis resulted in a multi-level model that provides a regression coefficient (ß) with standard error (SE) as a predictive index measure of factors significantly associated with intermediate health outcomes. HbA1c was significantly higher in those with longer duration of diabetes (ß=0.078, SE=0.019) but lower in those that were older (ß=–0.049, SE=0.019). Systolic BP was higher in those who were older (ß=–0.073, SE=0.021) while diastolic was lower (ß=–0.152, SE=0.022). Total cholesterol was higher in females (ß=0.156, SE=0.049) and lower in those patients complying with guidelines for the frequency of assessment in 2002 (ß=–0.104, SE=0.053).

The frequency of foot complications increased between 2000 and 2002 ($p<0.01$). There were no significant changes in the frequency of renal or eye complications.

Discussion

This cohort of patients on the diabetes registers represented only 10% of those estimated to have diabetes in 2002. This is at least partly because only some GPs participated in the registers and those participating may not have registered all those eligible. Yet, the patients may be representative: their GPs' demographics were similar to those of patients not registered, and the patients' demographics in the cohort were broadly similar to those in the AusDiab survey and the AIHW/BEACH morbidity survey[12] (*Table 3*). Medical records underestimate the care actually given,[13] so possibly patients received some care (eg. foot examinations) that were not recorded.

All the intermediate health outcomes except for BMI improved over the 3 years. The improvements were small. But they must be seen against the natural history of type 2 diabetes which predicts a deterioration.[14] These improvements instead are similar to those demonstrated in trials in general practice testing structured care,[15] and, extrapolating from results of the UKPDS study, the observed 2 mmHg change in BP and the observed 0.2% change in HbA1c should result in a 2.4% and

Table 2. Changes in process of care and outcomes between 2000–2002

Screening item	Minimum screening internal (months)	Proportion of patients completing assessment in each year (%) 2000	2001	2002
Body mass index	6	64.4	66.2	68.7
Blood pressure	6	85.1	86.0	81.7
Eyes	24	52.5	62.5	60.2
Feet	6	64.4	68.7	66.6
Lipids	12	71.6	71.2	65.0
HbA1c	6	76.0	80.4	75.5
Microalbumin	12	47.2	50.4	46.5
Intermediate outcome measures – means (95% confidence intervals)				
HbA1c		7.42 (7.35–7.49)	7.25 (7.19–7.31)	7.24 (7.18–7.29)*
Body mass index		30.5 (30.2–30.9)	30.4 (30.0–30.7)	30.4 (30.1–30.7)
Systolic BP		138.2 (137.5–138.9)	136.0 (136.2–137.6)	136.2 (135.5–136.9)*
Diastolic BP		79.8 (79.4–80.1)	78.6 (78.2–79.0)	78.2 (77.9–78.6)*
Total cholesterol		5.13 (5.08–5.17)	4.97 (4.93–5.02)	4.85 (4.80–4.89)*
HDL cholesterol		1.21 (1.18–1.25)	1.25 (1.20–1.29)	1.23 (1.20–1.26)
LDL cholesterol		2.99 (2.94–3.04)	2.82 (2.77–2.87)	2.74 (2.70–2.79)*
Triglycerides		2.22 (2.15–2.29)	2.10 (2.04–2.16)	2.06 (2.00–2.13)*
Proportion of patients with complications (95% confidence intervals)				
Microalbuminuria		23.8 (21.4–26.5)	21.2 (18.9–23.5)	24.6 (22.2–22.7)
Feet complications		13.8 (12.2–15.4)	14.6 (13.0–16.2)	16.5 (14.8–18.2)
Eye complications		8.8 (7.3–10.3)	8.8 (7.5–10.1)	9.0 (7.6–10.4)

* t-test 2000–2002 $p<0.001$

Table 3. Age of patients in the cohort (n=2731) compared with patients with type 2 diabetes in the BEACH study (21) and type 2 diabetes in the AusDiab study weighted for the Australian population in 1998, 25 years and older (16)

		Age groups <24	25–44	45–64	65–74	75+	Missing
	Cohort in this study	0	4.1	40.6	31.5	22.2	1.5
%	**BEACH (12)**	1.5	7.9	38.7	30.5	21.3	0
	AusDiab (16)		8.8	39.7	26.3	25.2	0

4.2% respective reduction in macrovascular complications association.[16,17]

This was an observational study, so we cannot be certain what caused the improvements. Perhaps the decrease in total cholesterol was from compliance with guidelines, including the introduction of the National Integrated Diabetes Program for Australian general practice and incentives for practices to complete the 'annual cycle of care',[18] the use of division registers to prompt patients and give GPs clinical audit feedback, or broader changes in society at large such as the increasing attention on reducing dietary fat.

Disappointingly, improvements in HbA1C and BP were not accompanied by decreased obesity, consistent with other studies.[15] This requires education and motivation. Reported referral rates to diabetes educators or dieticians were low, even among those with a BMI of 30 or more. Perhaps we need more intensive lifestyle interventions in this area of care.

Diabetes registers, in addition to supporting clinical audit and reminders, provide longitudinal patient data that may be useful in examining trends in general practice.

Implications for general practice

- Division level patient registers provided useful data on diabetes care in primary care.
- This suggests improvements in care based on physiological measures and clinical outcomes.

Conflict of interest: none.

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References

1. UK Prospective Diabetes Study Group. Intensive blood-glucose control with sulphonylureas or insulin compared with conventional treatment and risk of complications in patients with type 2 diabetes (UKPDS 33). Lancet 1998;352:837–53.
2. UK Prospective Diabetes Study Group. Tight blood pressure control and risk of macrovascular and microvascular complications in type 2 diabetes: UKPDS 38. BMJ 1998;317:703–13.
3. Griffin S. Diabetes care in general practice: meta-analysis of randomised control trials. BMJ 1998;317:390–6.
4. Wagner EH. Chronic disease management: What will it take to improve care for chronic disease? Eff Clin Pract 1998;1:2–4.
5. Burns J, Carter S, Bonney M, Truskett V, Powell Davies P, Harris M. National Divisions Diabetes Program Data Collation Project. Volume 2: Divisions of General Practice – Diabetes profiles. Division and program descriptions. Sydney: Centre for General Practice Integration Studies, School of Community Medicine UNSW, 2000.
6. Burns J, Carter S, Bonney M, Powell Davies PG, Harris MF. National Divisions Diabetes Program Data Collation Project. Volume 7: Policy framework for collation of data involving Divisions of General Practice. Sydney: Centre for General Practice Integration Studies, School of Community Medicine, UNSW, 2000.
7. The Royal Australian College of General Practitioners and Diabetes Australia. Diabetes management in general practice guidelines 2000. South Melbourne: RACGP, 2000.
8. National Health Data Committee 2003. Other Data Set Specification, Diabetes (clinical), National Health Data Dictionary. Version 12.AIHW cat. No HWI 47. Canberra: Australian Institute of Health and Welfare.
9. National Divisions Diabetes Program, Centre for General Practice Integration Studies. Available at: www.cgpis.unsw.edu.au [Accessed June 2004].
10. Australian Diabetes Obesity and Lifestyle Study (AusDiab). Diabesity and Associated Disorders in Australia 2000: the accelerating epidemic. International Diabetes Institute, 2001.
11. Goldstein H, Rasbash J, Plewis I, et al. A user's guide to MLwiN: Institute of Education, University of London, 1998.
12. Senses S, Britt H. A general practice view of cardiovascular disease and diabetes in Australia. AIHW cat. No. CVD 17. Canberra: AIHW, 2001.
13. Goudswaard AN, Lam K, Stolk RP, Rutten GEHM. Quality of recording of data from patients with type 2 diabetes is not a valid indicator of quality of care. A cross-sectional study. Fam Pract 2003;20:173–7.
14. Davids TME, Cull CA, Holman RR. Relationship between ethnicity and glycaemic control, lipid profiles, and blood pressure during the first 9 years of type 2 diabetes (UKPDS 55). Diabetes Care 2001;24:1167–74.
15. de Fine Olivarious, Beck-Nielsen H, Andreasen A, Horder M, Pederen PA. Randomised controlled trial of structured personal care of type 2 diabetes mellitus. BMJ 2001;323:1–9.
16. Adler AI, Stratton IM, Neil HAW, et al. Association of systolic blood pressure with macrovascular and microvascular complications of type 2 diabetes (UKPDS 36): prospective observational study. BMJ 2000;321:412–9.
17. Stratton IM, Adler AI, Neil AW, et al. Association of glycaemia with macrovascular and microvascular complications of type 2 diabetes (UKPDS 35): prospective observational study BMJ 2000;321:405–12.
18. Commonwealth Department of Health and Aged Care. National Integrated Diabetes Program. Available at: www.health.gov.au/pq/diabetes/nidp.htm [Accessed June 2004].

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